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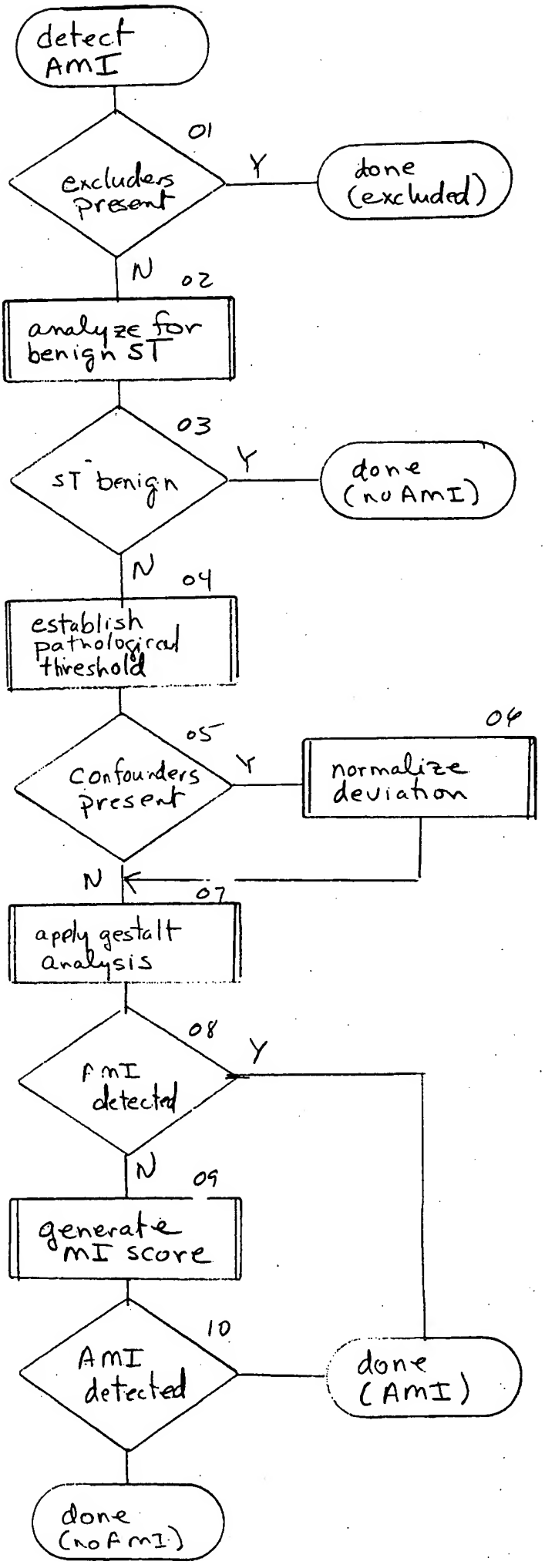
detect AMI
01
excluders present
Y
done (excluded)
N
02
analyze for benign ST
03
ST benign
Y
done (no AMI)
N
04
establish pathological threshold
05
confounders present
Y
06
normalize deviation
N
07
apply gestalt analysis
08
AMI detected
Y
N
09
generate MI score
10
AMI detected
done (AMI)
done (no AMI)

Fig. 1

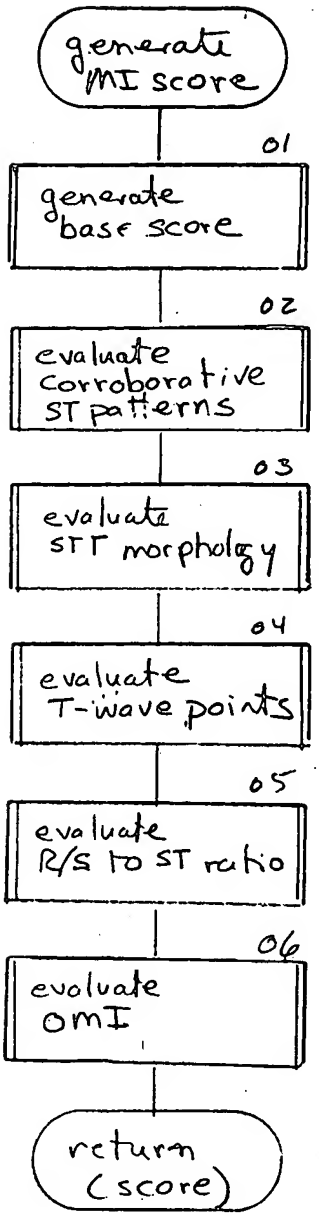
generate MI score
01
generate base score
02
evaluate corroborative ST patterns
03
evaluate ST morphology
04
evaluate T-wave points
05
evaluate R/S to ST ratio
06
evaluate OMI
return (score)

Fig. 2

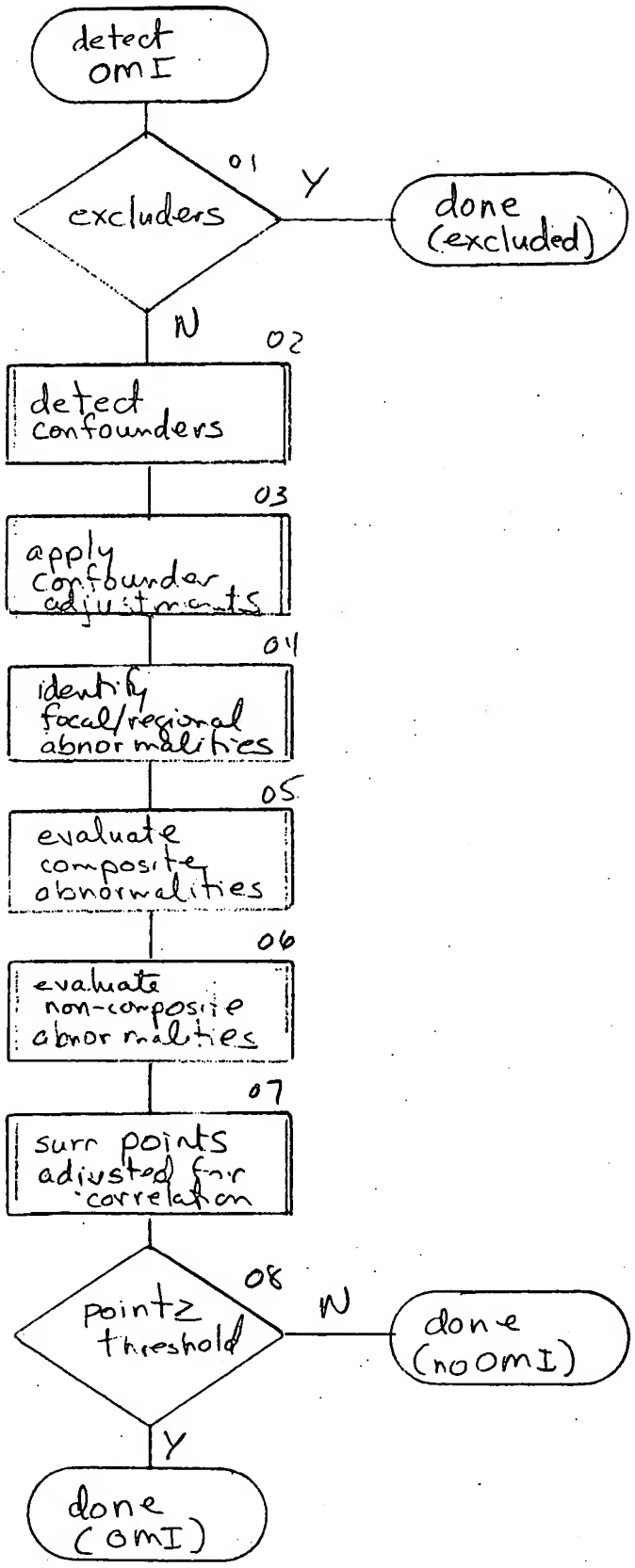
detect OMI
01
excluders
Y
done (excluded)
N
02
detect confounders
03
apply confounder adjustments
04
identify focal/regional abnormalities
05
evaluate composite abnormalities
06
evaluate non-composite abnormalities
07
surr points adjusted for correlation
08
points threshold
N
done (no OMI)
Y
done (OMI)

Fig 1

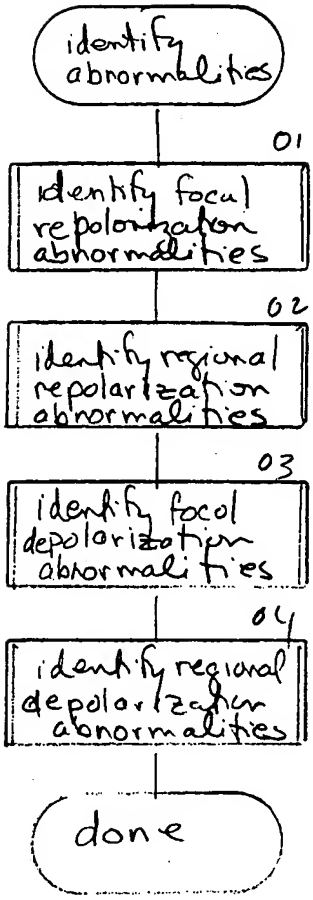
identify abnormalities
01
identify focal repolarization abnormalities
02
identify regional repolarization abnormalities
03
identify focal depolarization abnormalities
04
identify regional depolarization abnormalities
done

Fig 2

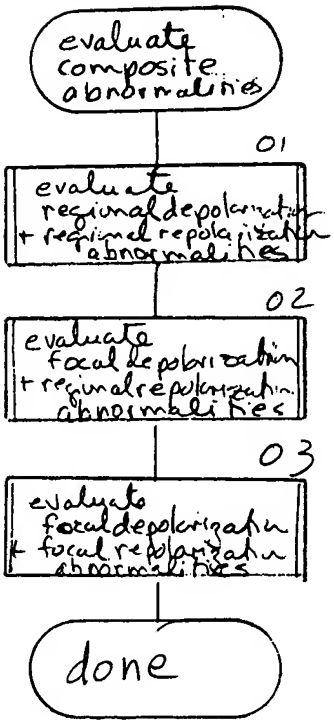
evaluate composite abnormalities
01
evaluate regional depolarization + regional repolarization abnormalities
02
evaluate focal depolarization + regional repolarization abnormalities
03
evaluate focal depolarization + focal repolarization abnormalities
done

Fig. 3

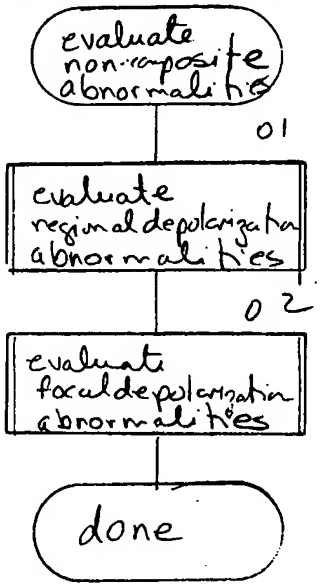
evaluate non-composite abnormalities
01
evaluate regional depolarization abnormalities
02
evaluate focal depolarization abnormalities
done

Fig 4

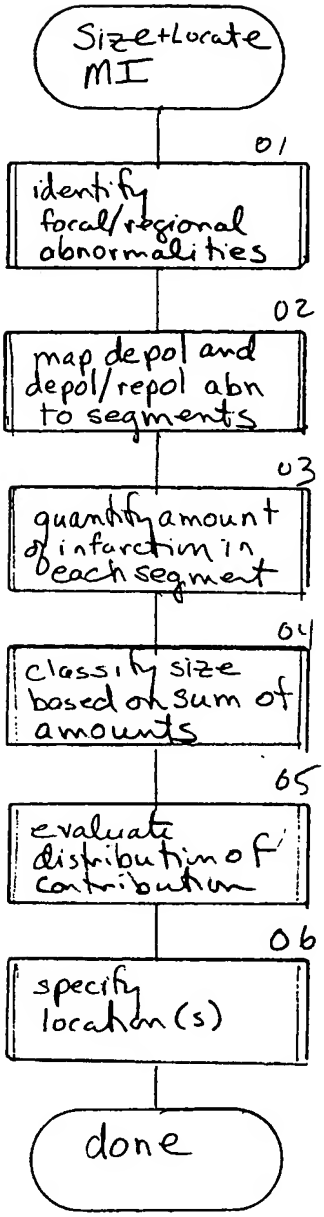
Size+Locate MI
01
identify focal/regional abnormalities
02
map depol and depol/repol abn to segments
03
quantify amount of infarction in each segment
04
classify size based on sum of amounts
05
evaluate distribution of contribution
06
specify location(s)
done

Fig 5

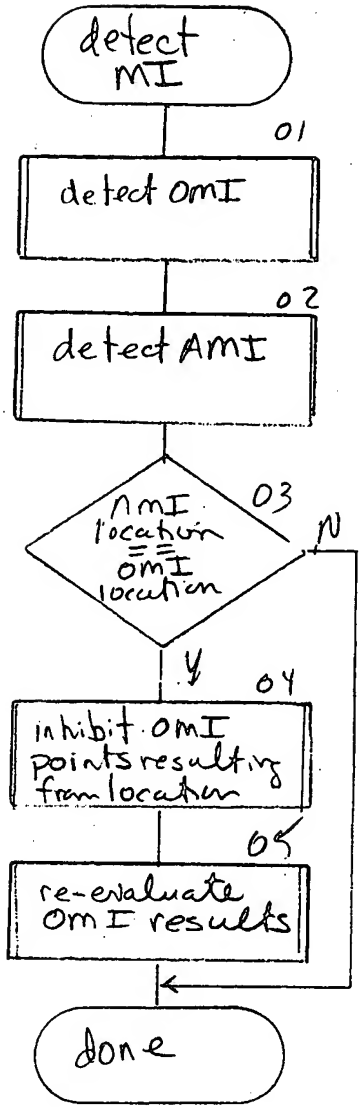
detect MI
01
detect OMI
02
detect AMI
03
AMI location = OMI location
N
Y
04
inhibit OMI points resulting from location
05
re-evaluate OMI results
done

Fig 7

Differentiating Acute Myocardial Infarction From Other ECG Abnormalities

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Clinical Relevance
(Incidence of confounders, difficulty in diagnosis of acute MI)

- LBBB ~5%; Vpacing ~9%
  - Very confusing for overreading clinician; often ignored
- RBBB ~6%
  - Guidelines not adjusted for this confounder (esp. anterior MI)
- LVH ~20% (by conventional ECG criteria)
  - LVH changes on ECG confounder for both sensitivity and specificity (esp. anterior MI)
- Inferior MI w/RV involvement
  - ~40% of RCA occlusions involving RV, with 8x relative risk
  - Clinician identification highly variable; absent for algorithms
- Non-STE ~60% of AMI
  - Borderline STE in this population ~2x for females as compared to males

ECG Algorithm Confounder Performance

Long Beach AMI, n=1151 , CK-MB >= 9 for rule-in

Method Sensitivity	LBBB n=52	RBBB n=90	LVH n=114	RVH n=27	V-pacing n=55	STE- Female n=263	RV ext n=64
CV	15%	56%	46%	52%	~15%	29%	~80%
Alg 1	2%	31%	11%	30%	-	7%	-
Alg 2	-	29%	25%	19%	-	10%	-
Alg 3	-	29%	25%	48%	-	17%	-

ECG Algorithm Confounder Performance

MCV AMI, n=1274 , CKMB/Troponin+ for rule-in

Method Sensitivity	LBBB n=26	RBBB n=39	LVH n=265	RVH -	V-pacing -	STE- Female n=405	RV ext -
CV	12%	38%	26%	-	-	15%	-
Alg 1	4%	31%	6%	-	-	7%	-
Alg 2	-	-	-	-	-	-	-
Alg 3	-	10%	19%	-	-	9%	-

AMI Criteria When RBBB+

- Adjust ST deviation to remove portion of STT abnormality due to block
  - ST baseline adjusted by 10% of difference between max and min amplitudes of final 1/3 of QRS complex
- Suppress detection of AMIs that are unseparable from RBBB
  - Posterior (-V1 to -V3, V6)

AMI Criteria When LBBB+

- Adjust ST deviation to remove portion of STT abnormality due to block
  - ST baseline adjusted by 10% of difference between (Rmax-STJ20) and (Smax-STJ20)
- Adjust STE deviation threshold for calling acute
  - Limb leads: increase by 50uv (100 to 150)
  - Precordial leads: increase by 75uV (200 to 275)
- Suppress detection of acute MIs that are unseparable from LBBB
  - Anterior (V1-V5)
  - Subendocardial injury
- Add qualifiers to improve specificity
  - Posterior AMI only when non-adjusted depression present in V1-V3

AMI Criteria With ECG Evidence for LVH

- Adjust ST deviation to remove portion of STT abnormality due to "LVH with Repol"
  - ST baseline adjusted by 5% of difference between (Rmax-STJ20) and (Smax-STJ20)
- Adjust ST deviation to remove portion of STT abnormality due to "LVH without Repol"
  - Limb: ST baseline adjusted by 2.5% of difference between (Rmax-STJ20) and (Smax-STJ20)
  - Precordial: ST baseline adjust by lead by -50 to +50uV

Questions for Discussion

- Pursuing AMI detection when confounders present
  - Is there a consensus about clinical relevance?
  - Is it possible to distinguish these confounders from AMI?
  - Are females significantly under-diagnosed for STE AMI?
- If yes to the above…
  - Which is the most important, clinically?
  - Which is the most likely to yield to investigation?
- If no…
  - Where should we focus our AMI efforts?